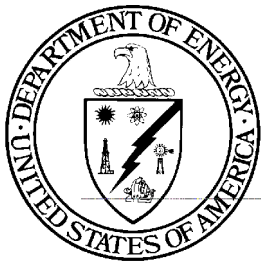


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CALCULATING COST SAVINGS From Sharing of Training Materials

Prepared for
**U. S. Department of Energy
Office of Nuclear Safety
Policy and Standards**



by the
Nuclear Facility Personnel Qualification Policy and Standards Program

CALCULATING COST SAVINGS

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INTRODUCTION

This document was developed to help Department of Energy (DOE) operations offices and contractors evaluate and document cost savings that result from sharing training-related information. Savings occur when this information can be used in training programs at more than one facility. Savings may be realized in a variety of ways, including but not limited to, joint development efforts, sharing training courses and seminars, sharing procedures, and sharing generic training materials such as fundamentals materials (handbooks, primers, etc.).

This document contains sections for evaluating cost savings in the following areas:

1. Joint development of training materials
2. Sharing training course/seminar material (turnovers)
3. Sharing procedures and policies
4. Sharing fundamentals materials (handbooks, primers, etc.).

Each section contains criteria and directions for evaluating cost savings in the area of interest, an example of how the savings are calculated, and a blank worksheet for documenting the savings. Additional areas for evaluation will be developed in the future and distributed.

The use of this information and the evaluation of cost savings is a voluntary exercise. Suggestions for improvement to the evaluation process for cost savings should be forwarded to:

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HOW TO USE THIS DOCUMENT

To determine the cost savings resulting from a shared procedure (for instance), turn to the section on Sharing Procedures and Policies and study the criteria for determining cost savings. Follow the accompanying examples to calculate the savings using the cost savings worksheet. Directions are included to help complete each worksheet, which also serves as a method for documentation of savings. Copies of the completed worksheets should be forwarded to the organization that supplied the training material so that they can identify additional value provided by their training programs and quantify savings associated with sharing materials.

There are instances in which the actual costs associated with development of materials are either difficult to obtain or unavailable. Therefore, it is sometimes necessary to estimate costs in order to calculate savings. For the purposes of this guide, and to help others when actual costs are not known, certain assumptions have been included. These assumptions, while not precise, represent industry standards and actual costs and times provided by contractors at selected DOE nuclear facilities when this guidance was being developed. Labor rates include the fully burdened hourly rates, which includes overhead, benefits, material and handling, etc. The following assumptions were used to calculate savings:

1. Development costs (training modules, courses, procedures, and related materials) \$60/hr
2. Review costs (accounts for 1st line supervisor time) \$65/hr
3. Approval costs (accounts for management time) \$75/hr
4. Development time per hour of instruction (classroom) 35-45 hrs of development/hr of classroom time. For technical fundamentals, an average of 50 hrs of development time/hr of classroom instruction is used to account for the increased complexity of the materials and the expertise of the reviewers (e.g., engineering support staff personnel).

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JOINT DEVELOPMENT EFFORTS

Description

A joint development effort occurs when a group of people from different facilities or sites collaborate on the development of training material, usually a course consisting of two or more modules. Participants in the group agree ahead of time to use the new materials at their facility/site. While the material should be as generic as possible to allow users to adapt it easily, individual sites or facilities will generally make minor revisions to meet specific requirements.

Example of a Joint Development Effort

An example of a joint development effort was the chemical technician training program working group. A workshop was conducted to identify and define the generically applicable elements of the chemistry technician training program. Workshop attendees included subject matter and training experts in the chemistry technician discipline. These persons were successful in identifying and reaching consensus on the training topics that applied to all of the facilities they represented. A total of 37 modules were identified for development for the program which would be used by 16 contractors. Full adoption of the chemical technician training program by the contractors had the potential for significant cost savings (an estimated \$21M).

The implementation and cost savings evaluation process for joint development efforts may be summarized as follows:

1. Confirm the generic applicability and need for a course/module.
2. Identify the courses or modules to be developed.
3. Identify participants that have subject-matter and instructional expertise in the required material.
4. Obtain agreement that participants will implement the training when the material is developed.
5. Conduct preliminary surveys or information gathering to allow a productive joint session with the participants.
6. Bring the potential participants together to accomplish the following:
 - a. Agree on the need.
 - b. Identify the target audience.
 - c. Identify the content of material needed.
 - d. Assign development and review responsibilities.
 - e. Establish completion dates for development and review.

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7. Develop the material.
8. Review the material.
9. Ensure that participants and others with this need receive the proposed material.
10. Verify implementation by the participants.
11. Identify costs associated with the development and review process.
12. Calculate the savings realized as a result of this activity.

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Example Calculations of Cost Savings

Calculating cost savings of joint development efforts consists of three steps.

1. Determine the development cost of each course/module. The development cost should be provided by the organization that provides the course/module. If the provider cannot supply this information, the development cost should be estimated as in the following example:

Development Cost:

The development cost should include *all* expenses incurred during the preparation of the course/module, including travel, labor, and materials. For example, Module A of a course was developed by Ms. X. She spent 200 hours on the development and 80 hours revising the module based on comments received from reviewers. Ms. X's fully burdened labor rate is \$60 per hour.

$$(200 \text{ hours (development)} + 80 \text{ hours (revision)}) \times \$60 \text{ per hour} = \$16,800.$$

Review costs must also be included. Module A required a review by 3 people. Each person spent 20 hours reviewing the module at a fully burdened labor rate of \$65 per hour. The total review cost is:

$$3 \text{ people} \times 20 \text{ hr/person} \times \$65/\text{hr} = \$3,900$$

Travel, material, and other non-labor expenses are \$3,000.

Therefore, the total development cost is

$$\$16,800 + \$3,900 + \$3,000 = \$23,700.$$

If the developer cannot provide the above information, the development cost should be estimated using a standard of 35 to 45 hours of development time per hour of instruction. A fully burdened labor rate of \$60/hr should be used for this calculation. For example, the estimated development cost for a week-long course would be:

$$40 \text{ course hours} \times 40 \text{ hours development/course hour} \times \$60/\text{labor hour} = \$96,000.$$

2. Determine the number of facilities using each course/module (does not include the developing facility).
3. Multiply the number of facilities using the course by its development cost to determine the savings associated with that course/module. Any modification expenses incurred by the end-user must be subtracted from this amount.

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Calculating Cost Savings:

- a. Module B cost \$40K to develop, review, and revise and 20 contractors (excluding the original developer) will use the module without revision.

$\$40K \times 20 \text{ users} = \$800K \text{ savings for Module B.}$

- b. Module C cost \$30K to develop, review, and revise and 20 contractors will use the module without revision.

$\$30K \times 20 \text{ users} = \$600K \text{ savings for Module C.}$

Each course/module will be analyzed this way and the total savings for all courses/modules will reflect the total savings.

Total savings from Module B and Module C is \$1,400K.

- c. If modification of a course is required to meet a particular recipient's needs, the cost for modification must be subtracted from the savings that would have resulted if the course had been implemented "as is." If, in the example above, three (3) of the twenty recipients for Module B each modified the course at a cost of \$10K, then the total cost savings for Module B would be:

$\$40K \times 17 \text{ recipients} + \$30K \times 3 \text{ recipients} = \$770K \text{ savings for Module B.}$

CALCULATING COST SAVINGS

JOINT DEVELOPMENT EFFORT WORKSHEET

Directions:

1. The provider of the training material should list the courses provided to the recipient, as well as the development cost of each course/module in columns (a) and (b), respectively. If the development cost is not known, it may be estimated per the previous examples. The provider should then send a copy of the worksheet to the recipient who will complete columns (c), (d), and (e).
2. The recipient should list the number of facilities at their site using the course, as well as any end-user modification costs. Enter these in columns (c) and (d), respectively.
3. The recipient should calculate the savings from each course using the equation in column (e).
4. The recipient should add all entries listed in column (e) and enter the total in the blank provided at the bottom of the worksheet. This is the total savings for the courses supplied to the recipient.
5. A representative of the recipient facility should validate the worksheet and sign it in the space provided. The representative should then forward a copy of the worksheet to the course provider so that the provider can document the cost savings for all modules.

(a) Course/ Module	(b) Development Cost (\$K)	(c) Number of Facilities	(d) End User Modification Cost (\$K)	(e) Savings (\$K) (b) x (c) - (d)
1.				
2.				
3.				
4.				
5.				
6.				
7.				

Total Savings \$ _____K

Recipient Facility Representative

Date

Provider Facility Representative

Date

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SHARING TRAINING COURSES AND SEMINARS

Description

The cost avoidance for training course and seminar turnovers comes from eliminating the need for all contractors to develop the courses and seminars for their internal use. A course turnover is when a course and its materials are "turned over" to another contractor for their internal use. Turnovers may consist of a delivery assist visit (teaching the course at the requesting facility) or in some instances, merely sharing of the course materials. Delivery costs include travel expenses as well as labor for the contractor that teaches the course.

Example Calculation of Cost Savings

To calculate the cost savings associated with course turnovers complete the following steps:

1. Obtain the development cost from the course developer. If the developer cannot provide the cost, use 35 - 45 hours of labor per hour of instruction x the fully burdened labor rate of the developer. (A fully burdened rate of \$60/hr is probably typical.)
2. Determine the cost of the turnover including travel expenses and material costs. This information should be supplied by the provider. Add any other implementation costs (i.e., local labor while attending a class delivery).
3. The recipient must calculate the cost of any revisions necessary to prepare the material for local use.
4. Subtract the turnover cost (2) and the local revision cost (3) from the development cost (1). This is the cost savings to the recipient (and to the Department of Energy) for this course turnover.
5. Add the cost for all turnovers of the same course to obtain the total cost savings associated with this course.

Example #1:

Suppose it cost contractor 1 \$100,000 to develop a 40 hour course. It costs contractor 2 \$10,000 to obtain the course from the developer, including travel expenses and course materials. Contractor B also incurs an expense of \$8,000 to modify the course to meet its requirements.

The savings to the Department for this turnover is:

$$\$100,000 - \$10,000 - \$8,000 = \$82,000$$

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Example #2:

Contractor #1 shared the above course with contractor #3. Contractor #3 used the course "as is" and did not incur any expenses to obtain the course other than the course materials which cost \$700.

The savings realized from this turnover is:

$$\$100,000 - \$700 = \$99,300.$$

Normally it will take at least two turnovers of a course to realize any savings. The total benefit for these two turnovers is:

$$\$82,000 + \$99,300 - \$100,000 = \$81,300.$$

NOTE: The development and turnover cost of some currently available courses has already been determined. The cost of the courses developed for the Office of Nuclear Safety Policy and Standards (EH-31) are listed below:

Course	Development Cost	Turnover Assist (includes delivery and materials)	Turnover Cost (materials only)
Basic Instructor Training (BIT)	\$143,000	\$16,100	\$670
Advanced Instructor Training (AIT)	\$75,000	\$8,000	\$630
Instructional Analysis and Design (IAD)	\$174,000	\$16,800	\$690
Instructional Development (IDEV)	\$174,000	\$16,300	\$620
Testing Employee Performance (TEP)	\$174,000	\$16,300	\$620
Program Evaluation and Corrective Action (PECA)	\$170,000	\$13,100	\$550
On-the Job Training (OJT)	\$45,000	\$12,800	\$540
On-the Job Training Refresher	\$50,000	*	\$500
Table-Top Job Analysis (TTJA)	\$55,000	\$10,000	\$560
Table-Top Training Design (TTTD)	\$50,000	\$10,000	\$560

* Delivery assistance is not provided for this course.

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COURSE AND SEMINAR SHARING WORKSHEET

Directions:

1. Complete the blanks for the Course Title, Course Provider, and Course Recipient.
2. Enter the cost of initial course development in blank (a). This cost should be provided by the developer or it may be estimated as in the examples.
3. Enter the cost for obtaining the course in blank (b). This should include any travel expenses, material costs, or labor on the part of the provider or recipient.
4. Enter any implementation or revision costs in blank (c).
5. Calculate the cost savings using the equation in (d) and enter it in the blank provided.
6. Sign and date the bottom of the worksheet.
7. Forward a completed copy of this worksheet to the course provider.

Course Title: _____

Course Provider: _____

Course Recipient: _____

a. Cost of initial course development (calculated or provided by developer): _____

-

b. Turnover Cost: _____

c. Cost of implementation and revisions for local use: _____

d. Turnover savings: _____

Development costs (a)-cost of obtaining course (b)-implementation and revision cost

(c)= _____

Recipient Facility Representative

Date

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COURSE AND SEMINAR SUMMARY WORKSHEET

This worksheet is provided as a means for course developers to summarize the cost savings from all contractors to whom a particular course is turned over.

1. Enter the title of the course in the blank provided.
2. Record the data from all Course and Seminar Sharing Worksheets in the table below.
3. Calculate the Cumulative Savings according to the equation given in the table. For the first turnover, Cumulative Savings will be calculated by subtracting the development cost from the Turnover Savings (number will be negative). Thereafter, the Cumulative Savings will be the Cumulative Savings from the previous turnover plus the Turnover Savings from the current turnover.

Course and Seminar Summary Worksheet

Course/Seminar Title: _____

Development Cost (a): _____

Course Recipient (n)	Turnover Cost (b)	Revision Cost (c)	Turnover Savings (d)	Cumulative Savings d(n-1)+ d(n)
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

Provider Facility Representative

Date

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SHARING TRAINING COURSES AND SEMINARS

An example of a completed Summary Worksheet is given below:

Course Title: **On-the-Job Training**

Development Cost (a): **\$45,000**

Course Recipient (n)	Turnover Cost (b)	Revision Cost (c)	Turnover Savings (d)	Cumulative Savings d(n-1)+ d(n)
1. PANTEX	\$11,700	\$2,000	\$31,300	- \$13,700
2. MMES	\$11,700	0	\$33,300	\$19,600
3. REEC _o	\$11,700	\$500	\$32,800	\$52,400
4. LLNL	\$11,700	\$1,000	\$32,300	\$84,700
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				

Provider Facility Representative

Date

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SHARING PROCEDURES AND POLICIES

Description

Calculation of the savings associated with procedure and policy sharing is a simple process that involves some estimation. Because the procedure that is available has been developed to meet a need or requirement, the initial cost of development need not be recovered when determining savings. However, if the initial cost of the development is known, this amount may be used as a baseline when determining the savings to a recipient.

The calculation process may be accomplished in two ways:

1. When the initial development cost is known, the following steps should be used to calculate savings.
 - a. Identify the initial development cost of the procedure(s) being shared.
 - b. Revise the material to meet the local needs of the recipient.
 - c. Determine the difference in cost between initial development and revision.
 - d. Identify the difference calculated as the cost savings associated with that specific procedure sharing activity.
2. Calculation when the initial development cost is not known.
 - a. Estimate the cost of development for the recipient if the entire procedure had to be created by the recipient.
 - b. Revise the material (if necessary) to meet the local needs of the recipient.
 - c. Determine the difference in the cost between the estimated development cost and revision.
 - d. Identify the difference calculated as the cost savings associated with that specific sharing activity.

Example Calculation of Cost Savings

Example #1:

A procedure has been developed by contractor A at a cost of \$80K.

Contractor B obtains the procedure and revises it to meet local needs at a cost of \$15K.

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Example #1 (cont)

Cost difference: \$80K - \$15K = \$65K

Because contractor B did not need to completely develop the procedure, a savings of \$65K was realized.

Example #2:

A procedure has been developed by contractor A and sent to contractor B to revise and use. The cost of development is unknown.

To estimate development costs:

1. Estimate the hours of development, review, revision, and approval that would be required for contractor B to create the procedure.
2. Use the average fully-burdened rate of local participants to estimate the cost of development.

For this example it is assumed that the procedure is an important process procedure that will be used by several organizations to develop training material and programs. Because there are multiple users, a significant effort will be required in the review process to ensure the procedure fits the need of all users. Contractor B has a limited number of personnel with expertise in developing procedures and would require outside assistance if this procedure were developed locally.

Development effort estimates:

Initial development:	480 hours
Initial review (committee effort):	300 hours
First revision:	80 hours
Second review:	80 hours
Final revisions:	20 hours
Review for approval:	10 hours
Revisions:	20 hours
Committee review:	20 hours
Review and approval:	10 hours
Total hours (if the procedure were to be developed by contractor B) = 1,020	

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Example #2 (cont)

If:

Hourly rate of contracted developers is \$60 per hour.

Local average burdened rate of reviewers is \$65 per hour (SMEs and Supervisors).

Local average burdened rate of approvers is \$75 per hour (Managers).

Estimating Costs

Development

Initial	480 hours
First revision	80 hours
Final revision	20 hours
Revision for approval	20 hours
Total development time	600 hours
Developer cost	\$60 per hour
Cost of development:	$600 \text{ hours} \times \$60 \text{ per hour} = \$36,000$

Review

Initial review (committee)	300 hours
Second review	80 hours
Committee review	20 hours
Total review time	400 hours
Reviewer cost	\$65 per hour
Cost of review:	$400 \text{ hours} \times \$65 \text{ per hour} = \$26,000$

Approval

Initial approval review	10 hours
Final approval review	10 hours
Total approval time	20 hours
Approvers cost	\$75 per hour
Cost of approval:	$20 \text{ hours} \times \$75 \text{ per hour} = \$1,500$

Total Estimated Cost of Development by Contractor b = \$63,500.

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Example #2 (cont)

Contractor B obtains the procedure and accomplishes revisions (120 hrs) to meet local needs at an actual cost of \$35K, which includes similar review and approval costs.

Cost difference: $\$63.5K - \$35K = \$28.5K$

Because contractor B did not need to completely develop the procedure, a savings of \$28.5K was realized.

Total Estimated Savings to Contractor b = \$28,500.

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PROCEDURE SHARING WORKSHEET

Directions:

1. The provider of the procedure should fill in the blanks for the procedure title, provider, recipient, and development cost ((a) or (b)).
2. The provider should send a copy of this worksheet to the recipient along with the shared procedure.
3. The recipient will estimate the development cost (b) if not supplied by the provider.
4. The recipient will determine the cost of revision for their use and record it in blank (c).
5. The recipient will calculate the cost savings for this shared procedure according to the equation for (d) and record it in the space provided.
6. The recipient facility will validate and sign the worksheet and forward a copy to the provider for their records.

Procedure title: _____

Procedure Provider: _____

Procedure Recipient: _____

a. Procedure development cost (if known): _____

b. Estimated cost of initial procedure development: _____
(use only if calculated cost is not available)

c. Calculated cost of revisions for local use: _____

d. Cost savings:

Development cost (a or b) - Revision cost (c) = _____

Recipient Facility Representative

Date

Provider Facility Representative

Date

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SHARING OF FUNDAMENTALS MATERIALS

Description

Technical fundamentals is an important part of a comprehensive training program for numerous positions in operating organizations at Department-owned nuclear facilities. The Department has developed fundamentals training materials for several key areas that address the theory necessary to support technical operations in many facilities. This material is useful in initial and continuing training programs and has been used by many of the DOE contractor organizations.

Because the Department developed the material and it is available without cost to DOE and DOE contractors, recipients realize a significant cost savings when the material is used. The material is generically applicable to many functional job positions and requires little or no revision by contractors to meet their needs in this area. Use of the material precludes the necessity for costly internal development for contractors with employees that require fundamentals training.

Fundamentals training material has been developed and is available to DOE and contractor organizations in the following topical areas:

Mathematics Vol. 1 and 2

Classical Physics

Nuclear Physics and Reactor Theory Vol. 1 and 2

Materials Science Vol. 1 and 2

Electrical Science Vol. 1, 2, 3, and 4

Mechanical Science Vol. 1 and 2

Chemistry Vol. 1 and 2

Engineering Symbology, Prints, and Drawings Vol. 1 and 2

Heat Transfer, Fluid Flow, and Thermodynamics Vol. 1, 2, and 3

Instrumentation and Controls Vol. 1 and 2

Calculation of the savings associated with provision of fundamentals training materials involves some estimation. Because the material that is available has been developed to meet a need or requirement, the initial cost of development need not be recovered when determining savings. Each time a DOE or contractor organization adopts available material, a cost savings is realized because the material did not have to be developed internally. This savings will be significant in many instances because the expertise is often not available locally for much of the material and outside vendors would have to be used if the material were developed internally.

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Assumptions

1. Development of material for fundamentals requires 50 hours of effort for each hour of classroom training that results from the development effort. This number of hours is required because of the complexity of material, the need for detailed review, and the high level of structure needed for instructional guidance.
2. Development of material for fundamentals requires 40 hours of effort for each hour of self study that results from the development effort.
3. When subject matter expertise exists, a contractor uses the fully burdened rate for the subject matter expert and includes the fully burdened rate for training expertise that is involved.
4. When local subject matter expertise is not available, the user should estimate the savings based on the projected cost of using a vendor for the development. Contractors should use a rate of \$60 per hour for vendor services.
5. When a person is exempted from attending classroom or participating in self study as result of the use of examination questions from the fundamentals examination bank, the savings that result are equal to the fully burdened hourly rate of the person times the amount of time the person did not spend in training.

Savings will be realized in three ways:

1. Savings from implementation in classroom training.
2. Savings from implementation in self-study programs.
3. Savings in student time realized by "testing out" of required training.

Classroom Training

Multiply the number of hours of classroom training by 50 to determine the estimated number of hours that would have been required to develop the material internally.

Classroom hours x 50 = _____ development hours saved.

Identify the average fully burdened rate for local developers. _____.

If experts in this area not available, assume use of an outside vendor at a rate of \$60 per hour.

Multiply the number of development hours saved by the fully burdened rate for developers to determine the cost savings for this training.

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Development hours saved _____ x fully burdened rate _____ = cost savings for this classroom training _____.

Self Study Programs

Multiply the average number of hours required to complete the self-study program by 40 to determine the estimated number of hours that would have been required to develop the material internally.

Average hours to complete the self-study x 40 = _____ development hours saved.

Identify the average fully burdened rate for local developers that have expertise in this area.

\$ _____ /hr

If experts in this area are not available, assume use of an outside vendor at a rate of \$60 per hour.

Multiply the number of development hours saved by the fully burdened rate for developers to determine the cost savings for this self-study program.

Development hours saved _____ x fully burdened rate = _____ cost savings for this self-study program.

Test Out/challenge Examinations

Identify the number of persons who have successfully "tested out" of the training (either classroom, self study, or other).

Determine the average fully burdened rate of persons who have successfully tested out of the training _____.

Estimate the duration of classroom training which was avoided through successful test out _____ or the average length of time required to complete the self-study program which was avoided through successful test out _____.

The number of students who test out multiplied by their average fully burdened rate multiplied by the amount of training time avoided through test out will calculate the cost savings realized.

The number of students who tested out _____ x the average fully burdened rate _____ x training time (in hours) avoided _____ x = cost savings from test out _____.

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Example Calculation of Cost Savings

Contractor A has received three fundamentals handbooks for use in local training programs. The handbooks are:

Mathematics
Classical Physics
Chemistry

Contractor A will use the Mathematics Handbook as part of their classroom training. Contractor A estimates that 40 hours of class time will be devoted to the Mathematics. The fully burdened rate for training course developers at this site is \$60/hr.

The Classical Physics Handbook will be used as part of their self-study program that takes an average 60 hours to complete. There are no training developers that have expertise in Classical Physics at this site.

The Chemistry Handbook and its examination bank will be used to pre-qualify 6 students for entry into their technician training program, thereby saving money by reducing the amount of training required for new employees. The average fully burdened labor rate for the students is \$35/hr.

Savings from Classroom Training

Mathematics:

The cost savings resulting from the use of the Mathematics Handbook as the basis for contractor A's class is:

$$40 \text{ class hrs} \times 50 \text{ development hrs/class hr} \times \$60/\text{hr} = \$120,000$$

Savings from Self-Study Programs

Classical Physics:

The number of development hours saved =

$$60 \text{ hrs self-study} \times 40 \text{ hrs development time/hr of self-study} = 2,400 \text{ hrs}$$

Since there are no developers available for this topic, a fully burdened labor rate of \$60/hr will be used to calculate savings. Therefore, the cost savings resulting from the use of the Classical Physics handbook in their self-study program is:

$$2,400 \text{ development hours saved} \times \$60/\text{development hour} = \$144,000$$

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Savings from Test-out

Chemistry:

6 students at a rate of \$35 per hour successfully pass tests which exempts them from 40 hours of classroom instruction. Therefore, the cost savings resulting from the use of this handbook and its examination bank are:

$$6 \text{ students} \times \$35/\text{hr}/\text{student} \times 40 \text{ hours} = \$8,400$$

The total cost savings experienced by Contractor A by using these three handbooks in their training program is:

$$\$120,000 + \$144,000 + \$8,400 = \$272,400$$

FUNDAMENTALS MATERIALS WORKSHEET